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ABSTRACT

The primary goal of the Metric Education Project was the systematic development of a replicable educational model to facilitate the system-wide conversion to the metric system during the next five to ten years. This document is an evaluation of that project. Three sets of statistical evidence exist to support the fact that the project has been effective. These are information on parents, teachers, and students. The primary source of knowledge of the metric system indicated by the parents was the children. The knowledge of the metric system of the teachers in the pilot schools has continued to increase. In addition, teachers in pilot schools scored significantly higher on a metric system questionnaire than teachers in control schools. The students in the pilot schools scored high on a cognitive test to determine knowledge level. Also, the students in the pilot schools scored significantly higher than those students in the control schools. The report also discusses the context of the project, the program itself, the design and analysis of the evaluation, and dissemination and assimilation. The Teacher Survey and Parent Survey on the metric system are included. (MP)

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METRICS THE MEASURE OF YOUR FUTURE

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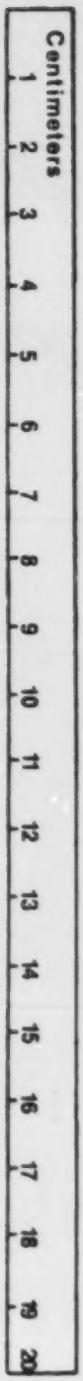

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EVALUATION REPORT

1977

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WINSTON-SALEM/FORSYTH COUNTY SCHOOLS

Winston-Salem, North Carolina

FINAL EVALUATION REPORT

FOR

E.S.E.A. TITLE III PROJECT

Metrics: The Measure of Your Future

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Project Director

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1977

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Metrics: The Measure of Your Future

CHAPTER 1

Summary

The primary goal of the project has been the systematic development of a replicable educational model to facilitate the system-wide conversion to the metric system during the next five to ten years. This includes demonstrating the model through the simultaneous implementation of the model in two schools for two reasons. The first is to determine the effective procedures involved in developing metric education. The second is the establishment of a demonstration site in order that dissemination and assimilation might be facilitated.

This project was designed to be undertaken in three stages, each covering one school year:

1974-75 Developing and Investigating
1975-76 Implementing and Refining
1976-77 Demonstrating and Evaluating

The activities of the first year centered around planning, developing and investigating. This process was facilitated through the diligent efforts of an advisory committee and four subcommittees. The committees, together with their major activities for the project years, are listed below:

A. Staff Development
   1. Workshops on the background and concepts of metric measurement
   2. Workshop on curriculum development
   3. Workshops on materials and equipment selection

B. Materials and Equipment
   1. Establishing a materials and equipment center in each school
   2. Establishing criteria for the selection of materials and equipment
   3. Screening materials and equipment for the materials centers

B. Materials and Equipment cont.
   4. Compiling an annotated bibliography of materials and equipment for metric education
   5. Keeping an inventory of materials and equipment acquired

C. Curriculum
   1. Preparing a log form and process for teacher reports on the use of measurement in all subject areas
   2. Preparing student behavioral objectives at each grade level
   3. Developing a metrics curriculum guide

D. Parent and Community Education
   1. Coordinating community efforts to understand the increasing use of metric measurements throughout our society
   2. Working on a guidebook for parents and tutors
   3. Assisting with brochures for general distribution and for selected groups

As a result of the efforts of the committees and the project staff, the students, parents, teachers, administrators and community are aware of the project itself and of the metric system. Teachers are knowledgeable of the background and concepts of metric measurement and students are knowledgeable about metric concepts appropriate to their grade level.

Probably the most important result of the first year was that careful planning, research and development occurred. Processes were developed whereby metric education could be more efficiently implemented in the project schools in the 1975-76 school year.

During the 1975-76 school year, the major activities and/or results included the continuation of committee work where needed, the systematic implementation of metric education in the classroom, the refinement of workshop procedures, the

development of a "Parent's Guide to Metric Homework" and the completion of the development of the curriculum guide which includes criterion-referenced tests.

Another element of the second year was the establishment of a metric materials laboratory. This contains nearly one thousand items which are available to educators throughout the school system and to other school systems in the area. The use of this materials laboratory makes possible a study and comparison of items to determine the most appropriate materials for purchase. The second year also brought forth a training program to develop leadership for in-service workshops in nonproject schools. The primary leaders in this effort were called MetriContacts; that is, Contact teachers in Metric concepts in nonproject schools.

During the third year, metric measurement has been treated as an integral part of the total curriculum. The teaching of customary units was continued to avoid penalizing project students' scores on standardized tests, which are only beginning to include metric items. Classrooms in both schools were open to visitors on a regular schedule.

The curriculum guide was submitted to a panel of educators selected by departments the State Department of Public Instruction. No major changes were suggested by this panel so the guide was unchanged.

Assimilation efforts were continued through the school system's staff-development program, which required all K-6

teachers to attend a three-hour session on integrating metrics into the curriculum, setting priorities and assuming responsibility. These sessions were coordinated by MetriContacts after a special training session. In the junior high schools, only mathematics and science teachers were involved.

In addition, forty-three K-8 schools offered in-service workshops for all teachers on the basic principles and background of the metric system. These workshops were also coordinated by MetriContacts using materials developed and/or prepared by project staff and the Mathematics Division of the State Department of Public Instruction.

Three sets of statistical evidence exist to support the fact that the project has been effective. The first is information on parents derived from the Parent Survey. It includes items related to sources of knowledge and actual knowledge. The second set of data has to do with teachers. This data was collected on the Teachers Survey and by the Project Director as a measure of attendance to ascertain interest in the metric concept. The third source of support is student data. The students were administered a cognitive test to determine knowledge level. Each of these three areas will be addressed below.

First is the parents. A Parent Survey was sent home with the students. Parents responded to questions related to their source of knowledge of the metric project as well as of the metric system. They also answered questions which actually measured their knowledge of the metric project and the metric

system. The primary sources of knowledge indicated were the project newsletter for project information and the children for knowledge of the metric system. Since both of these are strongly related to the project, they are indicants of project effectiveness. Another strong indicator of effectiveness is just in terms of the number of forms which were returned. During the first project year, only 274 forms were returned, whereas in the current project year 450 forms were returned.

The primary source of information on the teachers was the Teachers Survey. This instrument measured the knowledge of the teachers in the areas of length, area, volume, capacity, weight and temperature as well as some historical background. The knowledge of the teachers in the pilot schools has continued to increase. The overall average started at 18.90 in the first project year and increased to 22.75 in the current project year. This was out of a total possible of 25. A second comparison was made of teachers in pilot schools and teachers in schools of students who were designated as control students. When this comparison was made, the difference was highly significant. There is only one chance in 1,000 that the overall difference could have occurred by chance.

Student assessment did not occur during the first project year because that year was designated as a planning and learning year for teachers. During the second year, the knowledge of the students was measured using a criterion-referenced test which matched the curriculum guide. It contained only one item per

objective and was locally developed since no suitable instrument could be found elsewhere. The students scored high on this instrument in all of the grades. In some of the grades, the scores were so high that little opportunity was left to show any significant changes in the third year of the project. It was also felt that more items were needed per objective. Therefore, during the third project year, the test was expanded to include two items per objective. Control students were also tested to see if there were differences between the groups. These control students had had the opportunity to have been affected by the project also since the teachers in their schools had been a part of the staff development activities sponsored by the project. Despite this fact, the students in the pilot schools scored significantly higher than those students in the control schools at all grade levels. At each of the grade levels, there is only one chance in 1,000 that the difference observed could have occurred by chance.

These three measures of effectiveness strongly support the statement that the project has been effective with parents, teachers and students.

CHAPTER 2

Recommendations

The project evaluator has only one major recommendation based on summative evaluation. The recommendation is that, if the instruments used to measure student achievement are to be continued to be used, the test used in the lower grade be continually refined until the reliability indices are above .8. This recommendation holds only if group comparisons are to be made. If the achievement of the criterion is the objective, then the reliability estimate is inappropriate.

CHAPTER 3

The Context

The School System

The Winston-Salem/Forsyth County School system consists of 66 schools with an average daily membership of 45,281 in grades K-12.

The two schools served by this project are Brunson Elementary School and Wiley Junior High School. Brunson Elementary School Serves grades K-6 and Wiley Junior High School serves grades 7-8. All Brunson students are assigned to Wiley on completion of the sixth grade. There, they represent about 35% of the student population.

The Needs of the Target Population

The need for a tested plan of conversion to the metric system for public schools existed prior to the inception of the project. This need has not diminished in any way.

In fact, the approach to national change has accelerated to the point that soon school systems will be pressed to go metric, ready or not. The two metric bills passed by the Congress during this period will hasten the process. The first authorized the expenditure of up to $10 million a year for four years in special funds to encourage development of ways to facilitate change in educational institutions. Applications for special grants were solicited in late 1975, and the $2.2 million of appropriated funds was awarded by the U.S. Office of Education

to 72 projects in 48 states for one year proposals with October 1, 1976 start-up dates. New and renewal proposals are currently being processed.

The second bill, signed into law by President Ford on December 23, 1975, provides for the appointment of a Metric Commission to coordinate the voluntary changes being made in various segments of our society. Nominations were presented to the 94th Congress, which adjourned without acting on them. Names are currently being reviewed for presentation to the 95th Congress.

Further indicators of the change process include:

1. Some industries are taking advantage of the opportunity to change; for example, Coca-Cola has accompanied the introduction of their new litre bottles with TV commercials stressing the simplicity of metric measures and the fact that a "little more" is being sold for the same price as the old quart bottles. General Motors has marketed the first American-made all-metric car, complete with owner's manuals that include customary measurements in parentheses following measurement descriptions. It registers both miles per hour and kilometers per hour.

2. Consumers now find that in the average supermarket, 75% to 90% of the items bear metric markings.

3. The emphasis in educational materials and equipment has shifted to refinement of tested items. There are few really new ideas as compared to the previous years.

4. All states have now taken some action toward metric education, many targeting a completion date. (Note; There is a difference between assuring that the metric system will be well taught and abandoning the teaching of the customary system, which must await the readiness of our society.)

5. The climate of acceptance is growing, as evidenced by frequency of news items, magazine articles, and other media usage - references to measurements in metric units are no longer edited out of materials originating in other countries and are even being used in many cases in those produced in America. Many television and radio weather reports now include Celsius readings.

Given the trend toward conversion to the metric system in the United States, there can be little doubt that the schools must be prepared to train the students in the use of the metric system if the students and the schools are not to become antiquated.

Some of the needs out of which the idea for this project evolved and upon which the case for the development of the proposed model has been built may be described as follows:

1. The need for cooperative efforts among federal, state, and local governmental agencies in planning for metrication.

2. The need for a multi-agency planning committee to point the direction and to ensure a systematic, well coordinated conversion.

3. The need for a plan which will foster parent and community understanding and acceptance of the need for a program of metric education.

4. The need for more materials of good quality on the teaching and use of the metric system.

5. The need for textbooks which treat the metric system as the primary system of measurement.

6. The need for a clearinghouse to review, evaluate and recommend instructional materials, equipment and activities which will facilitate the transition to metric education.

7. The need for a uniform plan for teacher training and retraining in preparation for conversion to the metric system.

8. The need for documented information regarding the success and shortcomings of various projects on metric education in locations where such projects are being conducted.

9. The need for documented information regarding success and shortcomings encountered by those countries like Great Britain where the changeover to the metric system is nearly complete.

10. The need for more metric devices, calibrated in metric dimensions.

The Planning Process

The preliminary planning of this project was carried out by a committee of four individuals empaneled for the purpose of establishing the bofad components of aproject in metric education. This committee was made up of an elementary teacher, a junior high school mathematics teacher, the school system's science supervisor and the director of federal programs. The elementary teacher is on the faculty of a school where there is a commitment to metric education and where a limited program has been initiated prior to the project's existence.

This committee reviewed much literature, looked carefully at national developments and trends, surveyed the local scene to determine what was being done in the schools and reviewed plans of the State Department of Public Instruction to develop an overall plan of conversion to the metric system. Assistance was sought and received from the SDPI Director of the Division of Mathematics. This important link has been maintained throughout the project.

CHAPTER 4

The Program

Program Rationale

The primary goal of the project has been the systematic development of a replicable educational model to facilitate the system-wide conversion to the metric system during the next five to ten years. This includes demonstrating the model through the simultaneous implementation of the model in two schools for two reasons. The first is to determine the effective procedures involved in developing metric education. The second is the establishment of a demonstration site in order that dissemination and assimilation might be facilitated. The overall goals of the project were:

1. To promote cooperative planning between the LEA and other community agencies as a means of ensuring a smooth conversion to metric education.

2. To promote parent and community understanding and acceptance of the metric system, its superiority to the English system, and the practical necessity of making a conversion to this system in the near future.

3. To provide a staff development program which will be used as a model in the training of all teachers for a transition to the metric system.

4. To establish a model curriculum in metric education, which will be continuously tested in the two laboratory schools during the developmental phase of the project, and will serve as a model for system-wide metrication.

5. To promote in students an understanding of and facility in the use of metric units of measurements.

Performance Objectives

1.1 By June 1, 1977, representatives of the local education agency, civic clubs, colleges and universities, local government, private industry, and other key groups will be actively involved in the effort to incorporate metric education into the Winston-Salem/Forsyth County Schools, as determined by the records of the project director indicating the extent and degree of participation in the formative development of the project.

2.1 By June 1, 1977, interested parents of students in the two demonstration schools will have had an opportunity to participate in the parent involvement pilot program as indicated by the records of the project director indicating the extent and manner of their participation.

3.1 By June 1, 1977, all teachers in the demonstration schools will be knowledgeable of the background and basic concepts of the metric system as determined by the administration of the Teacher Survey, showing a significant increase in the scores as demonstrated by pre and post scores on the instrument.

4.1 By June 1, 1977, the project teachers will be able to identify the areas of special application of metric measurement specific to their teaching responsibilities, as determined by a curriculum guide judged appropriate by a panel of curriculum and measurement experts.

5.1 By June 1, 1977, 80% of the students in the two project schools will demonstrate a level of proficiency with metric measure appropriate to their grade level as determined by criterion-referenced tests prepared and/or selected by the project director, the external evaluator, and the classroom teacher.

Procedures

Personnel

The project staff which was supported by Title III funds included the Project Director and a secretary.

Activities

This project was designed to be undertaken in three stages,

each covering one school year:

1974-75	Developing and Investigating
1975-76	Implementing and Refining
1976-77	Demonstrating and Evaluating

The essential strategies which have guided the project and which have been prioritized for adopters are:

1. Real commitment throughout administrative levels;
2. Development of leadership in schools;
3. Retraining opportunities for all teachers;
4. Multidisciplinary curriculum revision;
5. Hands-on learning experiences;
6. "Think Metric Only" philosophy - not conversions;
7. Enlistment of parental involvement;
8. Broad-based community participation in planning;
9. Adult education opportunities.

The first year was primarily a year of development and investigation. There was no organized plan for introducing the metric system in the classroom. Rather, teachers were asked to teach and use the metric system in every class in some way in order that all students might learn the basic concepts and background of the system sometime during the year. Many different kinds of materials and equipment were tested with varied techniques and presentations.

At first, the teachers were surprised to find that the project was speaking to all teachers regardless of their subject area. The teachers have gradually begun to see their own essential roles in the change process. At the junior high level, the teachers have approached curriculum development on an inter-disciplinary basis without losing the nature of their separate disciplines.

Committee work has been important during all project years. Four subcommittees of the Planning and Coordinating Committee were established. They were:

Staff Development
Materials and Equipment
Curriculum
Parent and Community Education

Each teacher was asked to choose and participate on one subcommittee. Since the responsibilities and activities of each subcommittee were diverse, they will be presented separately.

Staff Development. The committee's responsibilities were the following:

1. Establish dates for all teacher inservice training.
2. Help plan workshops including the presentations by consultants, review of materials and equipment, and developing the units of study.
3. Select resource people for any staff development sessions.

A series of three-hour workshops was held on November 18, November 25, and December 2, 1974 for all teachers of the two schools. Mathematics specialists from the State Department of Public Instruction Division of Mathematics taught these sessions on the background and concepts of metric measurement.

On January 27, 1975 the fourth session, on Curriculum Development, was held at Wiley Laboratory School. Dr. Norma Bernhardt, elementary education specialist from Salem College, worked with all Brunson teachers while Dr. John Litcher, junior high school specialist from Wake Forest University, worked with all Wiley teachers.

On February 24, 1975, all project teachers met at Brunson Elementary School to review material and equipment standards and criteria under the direction of Dr. Nathan Simms, chairman of the Mathematics Department of Winston-Salem State University.

All teachers in the two project schools also attended a series of workshops on August 20, 1976, at Brunson Elementary School. A representative from each of the other K-8 schools in the county (called MetriContacts) was invited to participate, along with supervisory personnel of the instructional division of Winston-Salem/Forsyth County Schools. This was followed up by a series of workshops for all teachers new to the project schools and the MetriContact teachers. These workshops followed a similar format to the ones given in the first project year. The number of participants in the workshops during 1975-76 is presented in Table 1.

During the second and third project years, teachers from the project schools worked with the director in conducting the training workshops for MetriContacts. In the thir year, a fall workshop was planned to train teachers new to the project schools and replacements for some MetriContacts not returning to their schools. Attendance at these workshops is shown in Table 2 together with attendance at various other workshops held during the thir year.

In addition, the Winston-Salem/Forsyth County School System included one half-day session on metrics in its regular staff development program. These were coordinated by MetriContacts

TABLE 1

Number of Participants in Workshops

1975-76

K-4 Teachers - Metric Systems
October 23 - January 29 - 15 hours - 1.5 cr.

New to project schools	2
MetriContacts	22
Private schools	4
	28

5-8 Teachers - Metric System
October 21 - January 27 - 15 hours - 1.5 cr.

New to project schools	5
MetriContacts	29
Private schools	4
	38

K-8 Principals and Administrative Staff - Metric Change
October 23 - May 4 - 10 hours - 1 cr.

K-4 Principals	23
5-6 Principals	12
7-8 Principals	8
Administrative Staff	7
	50

K-8 Teachers - Metric System
March 30 - May 4 - 10 hours - 1 cr.

Teachers from non-project schools	36
Private schools	7
	43

K-8 Teachers - Metric Materials Selection - Preparation, and Use
April 1 - May 4 - 10 hours - 1 cr.

K-8 Teachers	21
Private schools	4
	25

TABLE 2

Staff Development Workshops - 1976-77
(excluding 10-hour in-service workshops in K-8 schools)

K-12 Teachers - Metric Education

June 21, 1976 - July 1, 1976 40 hours D. Henderson & V. Daniel
K-8 Teachers - Forsyth County 15
- Davie County 1
- not employed 12 28

K-8 MetriContacts - Metric Objectives

October 14, 1976 - 3 hours - V. Daniel
Training session for October 28. 48

K-8 Teachers - Metric Objectives

October 28, 1976 - 3½ hours - MetriContacts
Classroom Teachers and Administrators in each school 975

K-6 Mathematics Grade Level Chairmen - Training Session

August 18, 1976 - 3 hours - Dr. Dodson
Review of new (Metric) mathematics texts 122

K-6 Classroom Teachers and Administrators

August 19, 1976 - 3 hours - Math Chairmen 813
Review of new (Metric) mathematics texts in schools

K-8 Teachers - The Metric System

Sept. 16, 1976 - Oct. 6, 1976 - 10 hours - Project Teachers & V. Daniel
New MetriContacts 14
Brunson - new teachers 1
Wiley - new teachers 4 19

9-12 Teachers - Adult Basic Competencies in Metrics

April 20, 1977 - May 18, 1977 - 10 hours - V. Daniel
MetriContacts - Secondary 19
Cafeteria Training Coordinator 1 20

Stokes County K-8 Teachers - The Metric System (Intersystem Loan)

March 3, 1977 - March 24, 1977 - 10 hours - V. Daniel
Classroom Teachers 22
Principals 2 24

Special Education Teachers - Basic Metrics

Jan. 21, 1976 and June 17, 18, 1976 - 10 hours - V. Daniel
Special Education Teachers 64 (17 CRU's earned)

after a special training session, and monitored attendance was 975 as shown in Table 3.

MetriContacts also coordinated inservice workshops on metrics in their own schools on planning time. Materials were provided by the project office for ten one-hour sessions. Table 4 shows that 928 teachers earned a certificate renewal unit for these sessions.

During the project, through the efforts of the project director and the MetriContact teachers, at least 1200 teachers in the Winston-Salem/Forsyth system, have earned one or more certificate renewal units in metric education. Continuing assimilation efforts planned for the 1977-78 school year will make basic metric retraining available to at least 700 more, mostly at the elementary level. There will also be several hundred elementary teachers, mostly new employees needing inservice, to be completed in the fall semester, 1977.

Materials and Equipment. This committee's responsibilities were the following:

1. Screen materials and equipment for the materials centers;
2. Establish a materials and equipment center in each school;
3. Compile an annotated bibliography of materials and equipment for metric education;
4. Acquire metric materials;
5. Develop an evaluation form for materials;
6. Keep an inventory of materials and equipment acquired.

TABLE 3

Staff Development Workshop on Curriculum and Objectives
Led by MetriContact Teachers in Each School
October 28, 1976

School	Attendance	School	Attendance
Ardmore	24	Brown	21
Bolton	20	Cook	15
Brunson (Proj. Sch.-NA)		Diggs	21
Clemmons	35	Easton	17
Forest Park	41	Fairview	18
Griffith Elem.	27	Ibraham	25
Hall-Woodward	25	Kimberley Park	14
Kernersville Elem.	41	Lowrance	20
Konnoak	19	Mebane	15
Latham	20	North Elem.	13
Lewisville	27	Petree	24
Mineral Springs Elem.	29	Skyland	28
Moore	29	Dalton	4
Oak Summit	25	Glenn Jr. High	5
Old Richmond	20	Griffith Jr. High	4
Old Town	47	Jefferson	3
Rural Hall	27	Kernersville Jr. High	28
Sedge Garden	28	Mineral Springs Jr. High	8
Sherwood Forest	23	Northwest	4
South Fork	22	Philo	6
Speas	28	Southwest	12
Union Cross	24	Walkertown Jr. High	6
Vienna	17	Wiley (Proj. Sch.-NA)	
Walkertown Elem.	46		
Whitaker	20		

Total Attendance 975

TABLE 4

In-Service Workshops - Taught by MetriContacts using materials prepared by the Metric Education Project.

School	Level	K-8* Teachers	No. in Workshop	No. Credits
Ardmore	K-4	18	25	24
Bolton	K-4	17	24	22
Brunson (project school-NA)	1-6	27		
Clemmons	K-4	35	40	35
Forest Park	K-4	24	54	34
Griffith Elementary	K-4	27	28	24
Hall-Woodward	K-6	26	39	28
Kernersville Elementary	K-4	39	26	24
Konnoak	K-4	16	24	20
Latham (voted not to do this!)	K-4	18		
Lewisville	K-4	24	37	31
Mineral Springs Elementary	1-6	25	25	23
Moore	1-6	22	27	24
Oak Summit	K-4	24	30	29
Old Richmond	1-6	17	18	16
Old Town	K-4	45		
Rural Hall	K-4	26	9	8
Sedge Garden	K-4	25	20	17
Sherwood Forest	K-4	21	28	23
South Fork	K-4	20	19	17
Speas	K-4	27	30	29
Union Cross	K-4	22	25	22
Vienna	K-4	17	19	10
Walkertown Elementary	1-3	43	25	24
Whitaker	K-4	16	22	21
Subtotals		621	594	505

*Regular classroom teachers, excluding special education, counselors, part-time, etc.

TABLE 4 CONT.

In-Service Workshops - Taught by MetriContacts using materials prepared by the Metric Education Project.

School	Level	K-8* Teachers	No. in Workshop	No. Credits
Brown	5-6	19	26	21
Cook	5-6	15		
Diggs	5-6	17	15	13
Easton	5-6	15	18	17
Fairview	5-6	16	23	19
Ibraham	3-6	20	24	23
Kimberley Park	5-6	12	12	10
Lowrance	5-6	17	22	16
Mebane	5-6	10	20	15
North Elementary	5-6	12	15	14
Petree	3-6	17	31	30
Skyland	5-6	22	27	23
Dalton	7-8	22	18	13
Glenn Jr. High	7-8	28	23	22
Griffith Jr. High	7-8	22	27	25
Jefferson	7-8	20	33	22
Kernersville Jr. High	7-8	19	31	28
Mineral Springs Jr. High	7-8	29	43	24
Northwest	7-8	31	30	23
Philo (Spring 76)	7-8	20	27	27
Southwest	7-8	33	21	20
Walkertown Jr.	7-8	32	20	18
Wiley (project school-NA)	7-8	28		
	Subtotals	476	506	423

Total Teachers * 1097

Total No. in Workshop 1100

Total No. Credits 928

The screening process for materials and equipment included identifying approximately 278 publishers, manufacturers, and suppliers of metric items during the first project year, securing their catalogues or other listings, preparing numerous purchase requisitions and processing and distributing over 800 different items. No suitable evaluation form could be found, so the external evaluator researched and developed a set of instruments that make critical evaluation possible on a uniform basis. When a metric item is field-tested by a teacher, the proper form together with a bid sheet is completed and returned to the Materials and Equipment Committee to provide a basis for a comprehensive bibliography and to guide future purchases.

In addition to the in-house materials evaluation, a Materials Review was held at 14th Street School in 1974-75 in cooperation with the Mathematics Division of the State Department of Public Instruction. It was developed to combine Dr. Jones' concern with the lack of reliable information for teachers throughout the state on available metric teaching materials and the project's involvement in evaluating materials and equipment.

About 25 mathematics supervisors and master teachers from across the state came to Winston-Salem for a three-day review of materials submitted by publishers and suppliers to Dr. Jones. The materials accumulated over a two-month period at 14th Street School and remained there for seven weeks afterward. During that time they were available to individuals or groups who wished to consider them for adoption(no textbooks were reviewed). Six project teachers and the director participated in the review.

Another activity related to materials and equipment was generated out of a recognized need. Teachers of the special reading classes at Wiley Junior High noted that no easy-to-read materials suitable for junior high students had come to their attention. As a result, they began writing such materials. This will hopefully lead to improved ways to teach metric measurement with appropriate vocabulary, spelling and style for slower students.

Setting up materials centers in the project schools was not difficult, but many of the materials and equipment items were not suitably kept in such a center. Problems arose in lack of use and difficulty of assembling materials for workshops or showing materials to non-project teachers and others anxious to examine such items for themselves without touring both schools on a haphazard basis. As a solution, a metric materials laboratory was developed in connection with the project office which has a copy of each publication being tested and some equipment representative of the best and worst that has been found. Now an individual seeking to study materials or equipment will be able to see and compare them first, then arrange to see an item in use in a classroom or talk to a teacher experienced in its use.

Curriculum. The committee's responsibilities were the following:

1. Prepare a log form and process for teacher reports on use of measurement in all subject areas.
2. Review present curriculum with relation to use of measurement.

3. Determine how a changeover to metrics will affect the different subject areas and different grade level curriculum.

4. Prepare student behavioral objectives at each grade level and criteria for evaluating achievement of the objectives.

5. Relate materials and equipment to use in achieveing the behavioral objectives.

6. Begin work on a metrics curriculum guide.

The log forms were developed and distributed to the teachers early in the 1974-75 school year. Each teacher was to make careful note of any time during the year when measurement was used in the classroom whether the measurement used was metric or not. These logs were used to guide the decisions as the committee established behavioral objectives, planned activities and chose materials and equipment to be used in the 1975-76 project year.

In addition to using the log forms, the committee also had the benefit of the work which the teachers did in the workshop held in January. In this workshop, the teachers studied the curriculum of various other school systems across the nation and began writing broad goals and objectives for the project curriculum.

The broad goals and behavioral objectives to be used as the basis for the curriculum were completed in 1974-75. The Curriculum Guide itself was actually formally developed during the 1975-76 project year. It includes a statement of philosophy, the broad goals of metric education, behavioral objectives

classified by goal, activities, materials, a source list and the criterion referenced tests developed with items to measure each objective.

Parent and Community Education. The committee's responsibilities were the following:

1. Coordinate community efforts to understand the increasing use of metric measurements throughout our society by working with PTA's, school volunteers, PTA Enrichment Project, school newsletters and the "In-Basket", news media, civic clubs and ETV programs.

2. Plan a special night and/or after-school classes for parents of project students and others if the need arises.

3. Work on a guidebook for parents and tutors.

4. Plan for adult education classes to be offered through cooperating institutions.

5. Assist with brochures for general distribution and for selected groups.

The activities related to the parents and the community have been quite diverse. About 150 parents responded to the December, 1974 newsletter indicating that they favored the continuation of study sheets and/or would like to attend a workshop for parents. Therefore, the study sheets were continued and on March 20 at 8:30 a.m. a first informal workshop was offered. Fifteen mothers attended and their enthusiasm was apparent by their degree of participation.

A Metrics Night was held at the system's PTA Council meeting on April 17, 1975. A short film was shown and a brief presentation was made by a sixth-grade teacher. Displays were presented by Sears, R.J. Reynolds Industries, IBM, Western

Electric, J.C. Penny, Kaplan's School Supply and other to show local use of metrics and some effects on consumers.

Winston-Salem State University developed a 1-credit metrics course for its evening program beginning in 1974-75 which is open to students and adults in the community. It has been offered in the spring semester with moderate response.

Mr. James Lewis, a faculty member at Winsalm College, a local business and secretarial school, came to the project during the 1974-75 seeking information about the metric system. The project staff helped him to select suitable materials and equipment for teaching a business-related metric course in his school.

During 1975-76 and 1976-77, newsletters were again sent to parents of each of the students enrolled in the two project schools, timed to supplement other events; e.g., the return to school and metric studies, the ETV metric series, the Dixie Classic Fair Booth, publication of the parents' guide, N.C. Metric Week, planning the student testing, etc.

In 1976-77, Mr. Ralph Parsons, Advisory Council representative from Forsyth Technical Institute, developed a 33-hour course for adults which is to be offered each term. It incorporates materials from the Parents' Guide and the Teacher-training Packet.

A member of the Advisory Council suggested that parents might contribute ideas for the development of the "Parents' Guide to Metric Homework." A committee was formed consisting

of parents who had no prior participation in project planning. Their decision was that the contents should be limited to a simple explanation of metric terms and usages, supplemented by some tables of relationships. As a result of the work of this committee of parents, the material, distributed to parents during the first project year, was reworked into a small loose-leaf booklet of 16 pages, inexpensive enough to be made available to all parents in the system.

The booklets were distributed in the Spring of 1976 to parents of all project students. In grades K-6, they were sent home immediately and followed up by homework assignments prepared by each teacher to fit in with whatever metric activities her class was engaged in at that time. Junior high teachers used them as a mini-text in their classes, then asked students to give them to their parents. The two methods of handling did not seem to greatly affect parent response to the booklet. Because of the favorable response of parents, the guide was reprinted (28,000 additional copies) and distributed to families of all K-8 students in the LEA.

An interesting side result was a request for additional copies for use as a "readable" supplementary source in a course for nurses' aide at Forsyth Tech.

Other metric activities have been included in PTA programs, Parents' Day, Field Day, and other in-school events for parents during the year.

One major undertaking of the Parent-Community Relations Subcommittee was a Metrics Booth at the Dixie Classic Fair in 1975 and 1976. It included posters, hands-on measurement activities, a contest for a metric steel tape, and a sound-color slide presentation. Students from Wake Forest University, Salem College, and Winston-Salem State University assisted Advisory Council members and project students and teachers in maintaining the booth for the ten days of the fair. Response of fair-goers was very good(attendance at the fair averaged about 200,000 each year).

Student Involvement. One of the operational plans for the second project year was that all students at the two project schools be exposed to a uniform metrics curriculum. The exposure can be guaranteed; the uniformity cannot. In the project, behavioral objectives are the same for all students at the same level, but classroom treatments may vary, as teachers are expected to be selective in their use of suggested activities, meeting individual needs. Creative and innovative approaches are encouraged.

No curriculum changes were made during the third year. Project schools were open to visitors on a regular schedule.

Budget

Table 5 contains categorical budgets. It includes the total projected budget, the total actual budget, the actual 1974-75 budget, the actual 1975-76 budget and the actual 1976-77 budget.

TABLE 5

Categorical Budget

	Total Projected Budget	Total Actual Budget	Actual Budget 1974-75	Actual Budget 1975-76	Actual Budget 1976-77
Salaries					
Professional	$ 50,843	$ 50,110	$ 14,825	$ 17,174	$ 18,114
Non-professional	28,060	19,061	5,020	6,644	7,397
Fringe	12,726	12,989	3,800	4,340	4,849
Contracted Services	10,950	9,687	2,687	3,805	3,195
Staff Dev't. Workshops	14,025	12,931	4,980	4,163	3,788
Materials/Supplies	26,194	31,703	13,645	10,323	7,735
Travel	7,920	8,242	2,307	2,592	3,343
Equipment	1,754	2,103	1,070	926	107
Other Expenses	2,944	3,746	1,121	1,146	1,479
Indirect Costs	2,584	2,477	785	842	850
TOTAL EXPENDED		153,052	50,240	51,955	50,857
Fund Balance		2,948	1,760	45	1,143
Total Budget	$156,000	$156,000	$ 52,000	$ 52,000	$ 52,000

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This budget reflects a per teacher expenditure of $722.22 during 1974-75(72 teachers), $282.36 during 1975-76(184 teachers) and $49.91 during 1976-77(1019 teachers). It can also be seen to reflect a per pupil expenditure of $36.77 during 1975-76(1413 students) and $34.88 during 1976-77(1458 students). Per pupil expenditure is inappropriate for 1974-75 since students were not directly involved in the project during that year.

CHAPTER 5

Effectiveness

Design of the Evaluation

Apple Chill Educational Consultants, Inc. was employed to evaluate this project during the years 1974-77. Tasks involved in the evaluation were assigned as follows:

1. The project director and the evaluator jointly selected and/or developed instruments appropriate to the measurement of the project objectives.
2. The project staff collected data relevant to the project objectives.
3. The evaluation firm determined the degree to which major objectives were fulfilled through descriptive and statistical treatment of the data.
4. The evaluation firm interpreted the implications of the evaluation.

Evaluation Design

The objectives of the project were originally stated as a criterion level measure. As the project progressed, it became evident that a quasi-experimental design was more appropriate. Therefore, during the thir year of the project a matched group was selected and an experimental/control group design implemented.

A true control group model was not possible for this project. Rather, a matched group design, with some contamination, was employed. The contamination was the effect of activities designed to assimilate the project into the school system at the end of the federal funding. These activities were in the form of staff development for all teachers in the Winston-Salem/

Forsyth County Schools. Since an uncontaminated control group could not be found within the school system, it was conjectured that if relevant differences existed between the pilot group and a control group which was contaminated, then it could be inferred that differences would occur if a true control group existed.

Population

The pilot student population consisted of all of the students at Brunson Elementary School(grades K-6) and Wiley Junior High School (grades 7-8), their teachers and their parents. The matched group students consisted of all of the students at Sherwood Forest Elementary School(grades K-4), Kimberly Park Elementary School (grades 5-6) and Jefferson Junior High School(grades 7-8).

Both the Brunson-Wiley and the Sherwood Forest-Kimberly Park-Jefferson, K-8 sequences, serve students of the Northwest quadrant of the city of Winston-Salem. All students in that quadrant attend one or more of these schools before they finish the eighth grade. Both sequences include students from upper middle class families(urban and suburban) and from families who represent lower socio-economic status(mostly inner-city areas) in about the same proportions.

Table 6 presents the racial breakdown at the pilot schools, the matched schools and system-wide. It shows that the racial proportions are equivalent across the grade levels affected by the project with approximately 31% Black in grades K-6 and approximately 21% Black in grades 7-8.

When academic aptitude is compared using the Short Form Test of Academic Aptitude, the pilot group is slightly lower

TABLE 6

RACIAL BREAKDOWN*

Project Schools		Black	%	White	%	Total
Brunson	K-6	230	31	520	69	750
Wiley	7-8	153	22	555	78	708
		383	26	1075	74	1458
Matched Schools						
Sherwood Forest	K-4	184	35	339	65	523
Kimberly Park	5-6	128	28	334	72	462
Jefferson	7-8	111	20	449	80	560
		423	27	1122	73	1545
System-wide						
K-6		7911	35	14,517	65	22,428
7-8		2437	31	5,412	69	7,849
9-12		4227	29	10,159	71	14,386
Special Schools		393	64	225	36	618
		14,968	33	30,313	67	45,281

* Other minorities make up less than 1% of the student population in these schools

than the matched group in grade two. The reverse is true in grade 5. The summarization of this information is in Table 7. Information on the students in grades 7-8 would be irrelevant as it would be at least 2 and 1/2 years old. .

Summary data on all of the teachers and students in the Winston-Salem/Forsyth County School System is presented in Table 8. The descriptive data on the sample population is shown in Table 9. It gives the number of teachers and the number of students in the treatment group(pilot schools) and the same information for the matching group. Since the first year of the project was designated for planning and staff development, no descriptive data is applicable.

Measures Used in and Unique to the Project

The following instruments were used in the evaluation of this project:

Teacher Survey(Appendix A)
Parent Survey(Appendix B)
Student Criterion Referenced Tests(Published separately)

All of the instruments were developed specifically for the project.

During the second and third year of the project, efforts were made to find a norm-referenced instrument which would adequately measure the objectives of the curriculum which had been specified during the first year of the project. Mail and phone contacts were made to the following:

Publishers and testing firms
Metric organizations and other metric projects
U.S. Office of Education
National Bureau of Standards
Colleges and universities

TABLE 7

SHORT FORM TEST OF ACADEMIC APTITUDE
FALL 1976

Grade	Treatment N	Treatment Mean	Control N	Control Mean
2	85	107.50	113	111.03
5	152	113.53	184	105.46

TABLE 8

Population of Winston-Salem/Forsyth County Schools

Grade	Graded Classrooms Teachers	Students	Special Education Teachers	Students	Total Teachers	Students
K	101	2754				
1	140	3498				
2	134	3190				
3	121	2974				
4	104	3038				
5	100	2990				
6	113	3324				
K-6	813	21,768	64	660	877	22,428
7	141	3789				
8	143	3815				
7-8	284	7,604	19	228	303	7,832
9		3806				
10		3695				
9-10	364	7,501			364	7,501
11		3653				
12		3232				
11-12	302	6,885			302	6,885
Special Schools	94	618	2	17	96	635
System Totals	1857	44,376	85	905	1942	45,281
K-8 Totals	1097	29,372	83	888	1180	30,260
9-12 & others	760	15,004	2	17	762	15,021

TABLE 9

Descriptive Data on the Population

Grade	Treatment 1975-76 Number of Teachers	Treatment 1975-76 Number of Students	Treatment 1976-77 Number of Teachers	Treatment 1976-77 Number of Students	Matching 1976-77 Number of Teachers	Matching 1976-77 Number of Students
K	2	52	2	52	4	100
1	4	80	4	94	5	126
2	4	101	4	75	5	114
3	5	132	5	121	4	101
4	5	141	5	137	3	82
5	5	129	5	153	6	185
6	5	144	5	126	6	186
7	44	328	44	331	29	246
8		306		355		306
Spec. Ed. (7-8)	---	---	1	22	---	---
TOTAL	74	1413	75	1466	62	1446

Research and support organizations
Metrication Boards of other English-speaking nations.

No appropriate instrument was located. An instrument was, therefore, developed for each grade to match the curriculum. During the second project year, the tests contained only one item per objective. Because the Kuder-Richardson 20(KR-20) reliability estimates were low for this year and also because the students were, in fact topping out on the test, it was decided that the test should be expanded. During the third year of the project, the test was expanded to include two items per objective. Information on the KR-20 reliability estimates and the standard error of the measure is found in Table 14. The reliability estimates using the single item per objective tests progressed upward parallel with grade. The same estimates using two items per objective were higher in all grades besides kindergarten and grade two. The standard error estimates were reasonable at all grades based on the sample size and the number of items.

The Teacher Survey is a locally developed questionnaire. It consists of 25 questions(multiple choice) covering length, area, volume, capacity, weight, and temperature as well as some historical background. At this point in time, no reliability or validity studies have been completed.

The Parent Survey is also a locally developed questionnaire. It surveys the knowledge of the parents in relation to the project and also the metric concept. It also asks questions related to the source of the knowledge about the project and the metric system. No information on reliability or validity is available.

Performance Objectives

Objective 1.1. By June 1, 1977, representatives of LEA, civic clubs, colleges and universities, local government, private industry, and other key groups will be actively involved in the effort to incorporate metric education into the Winston-Salem/ Forsyth County Schools, as determined by the records of the project director indicating the extent and degree of participation in the formative development of the project.

Analysis On October 2, 1974, an organizational meeting of the project Advisory Council was held. The council has twenty-seven members, seven of whom are administrative staff in Winston-Salem/Forsyth County Schools. The remaining twenty members represent teachers, higher education in Forsyth County, industry, government, business, professional people and service organizations.

Almost all of the members have attended regular bimonthly meetings during the three project years. Although attendance has not been a problem, it was not especially desirable for a small group to be in an empty school building in the evening, which was the most convenient time for most members to attend. At the invitation of Mr. Gene Martin, a council member representing retail businesses, meetings during the second and third project years were held in the Sears' Executive Conference Room at Hanes Mall, where increased comfort and the busy parking lot made the sometimes lengthy meetings much more pleasant.

During the 1975-77 school years, the project secretary attended all Advisory Council meetings, taping them, making notes and subsequently preparing written summaries. This replaced the sketchy minutes kept during the first project year.

In addition to the council meetings, the members have also been active on one or more of the four subcommittees on staff development, curriculum, materials and equipment, and parent-community relations which met an average of once a month during the first project year. Subcommittee meetings during the second and third year were less frequent due to the change in emphasis from planning to implementation.

The Chairman, Mr. Charles Wray, resigned in February,1975, because of a deteriorating chronic health problem. The Council elected Mr. Joe R. Ridgill, Western Electric engineer in charge of their North Carolina metrication program and a member of the State Metric Coordinating Committee, as the new chairman. Mr Steve Bennett, public relations specialist for the Forsyth County Government, came on the Council to replace Mr. Wray. Mrs. Gloria Griffin, PTA council, succeeded Mr. Ridgill as chairman of the Parent-Community Involvement subcommittee. Dr. Litcher and Dr. Bernhardt, Dr. Simms, and Miss Bradshaw continued as chairpeople of the subcommittees on curriculum, staff development and materials respectively until developmental activities were complete.

The Advisory Council has continued its involvement in almost all activities outside the classrooms, which has given a continuity and stability most conducive to formative development of the project. The personal sense of responsibility also continues to manifest itself in countless ways which includes volunteering to meet a visiting consultant at the airport 35 miles away, providing materials and equipment on indefinite

"loan", preparing news items and making personal appearances on radio and television. One Advisory Council member personally designed and had printed four posters to be used in all classrooms and many retail stores during Metrics Week 1977.

Conclusion. The above detailed information from records kept by the project director indicates that this objective has definitely been achieved.

Objective 2.1. By June 1, 1977, interested parents of students in the two demonstration schools will have had an opportunity to participate in the parent involvement pilot program as indicated by the records of the project director indicating the extent and manner of their participation.

Analysis. As detailed in the section of this report on the Parent-Community Education subcommittee(Chapter 4), parents have been involved in the development of a parents' guide to homework. They have also been involved in the project through PTA programs, teacher-conducted metric workshops, parent days and other school projects.

In order to assess the knowledge and information which the parents have about the project and the metric system, a Parent Survey was sent home with all students in May 1975. A slightly revised survey(Appendix B) was sent home with all students in May 1976 and May 1977. Data was tabulated on all surveys which were returned.

The survey was constructed in order that the project might gain information on where parents were learning about the metric system and the project. The parents were allowed to indicate any and all sources of knowledge. The instrument also

contains five items which measure knowledge of the project and five items which measure knowledge of the metric system.

Table 10 presents the % of reponses to questions related to where parents learned about the project and the metric system during each of the project years. The project newsletter was the main source indicated for knowledge about the project for parents during all project years. The newspaper was the second most indicated source.

The newsletters were also an important source of knowledge of the metric system for both schools, but "your children" was the most prevalent source in 1975-76 and 1976-77. The second source for parents the newspaper and the "Parents Guide to Homework".

Some secondary sources of knowledge included school and/or college, work and Europe with some parents mentioning packaged products currently in the market-place as a source of knowledge.

Table 11 present the means and standard deviations of the parent responses to the items requiring knowledge of the project and the metric system. There is consistently in both schools for all years more knowledge of the metric system itself than of the project.

There was a slight decrease in the mean of knowledge of both the project and the metric system at Brunson in 1975-76 which caused the overall mean to decrease. The mean on knowledge of the project decreased in both schools in 1976-77. The mean on knowledge of the metric system was higher in both schools and overall in the last year of the project.

TABLE 10

% of Responses to Questions

Related to Where Parents Learned

About the Project and the Metric System

	1974-75		1975-76		1976-77	
	Brunson	Wiley	Brunson	Wiley	Brunson	Wiley
Project						
Newsletter	87	84	92	80	71	61
Newspaper	47	45	44	52	47	54
PTA Meetings	33	16	27	32	29	19
TV or Radio	16	13	17	20	27	33
Other	19	13	18	31	22	26
Metric System						
Dixie Classic Fair			11	9	11	13
Parent Guide to Homework			69	57	57	49
Newspaper & Magazines	49	44	46	49	43	47
School newsletters	74	66	71	64	54	43
Your Children	64	58	81	73	71	74
TV or Radio	24	19	20	25	33	35
Books	26	16	29	30	28	31
Workshops and/or PTA	9	8	18	19	17	13
Shopping Center Exhibits			9	12	13	20
Other	11	5	23	34	20	25
College						
Europe						
Work						
Packaging						

TABLE 11

PARENT SURVEY

Project, Metric and Total Score

Means and Standard Deviations

School		Project		Metric		Total	
	N	Mean	S.D.	Mean	S.D.	Mean	S.D.
Brunson							
1974-75	212	3.40	1.09	4.46	1.03	7.86	1.77
1975-76	134	3.23	1.08	4.27	1.09	7.50	1.09
1976-77	350	2.17	1.20	4.57	.87	6.74	1.34
Wiley							
1974-75	62	3.06	1.23	4.29	1.09	7.35	1.90
1975-76	96	3.31	1.14	4.58	.63	7.90	1.12
1976-77	231	2.85	1.17	4.56	.89	7.42	1.42
Both							
1974-75	274	3.32	1.11	4.44	1.01	7.77	1.77
1975-76	230	3.26	1.09	4.40	.94	7.67	1.50
1976-77	581	2.44	1.24	4.57	.88	7.01	1.47

Conclusions. Parents have indicated a strong awareness of both the project and the metric system during all project years. The primary source of this knowledge appears to the project newsletter and the children of the parents. This is definitely evidence that the project through the students is affecting the parents.

The major indicant in the results in Table 11 is the increase in number of surveys returned. By the third year, the number of surveys returned by parents of elementary students was nearly 1/2 the number of students at that level. The number of surveys returned by parents of junior high students was over 1/3 the number of students at that level. This indicates a much higher level of interest than in either of the previous years.

A reasonable knowledge of the project and the metric system is indicated in Table 11. Caution should be used in interpreting this data since the number of items was kept at a minimum in order to encourage parents to respond to and return the survey.

Objective 3.1. By June 1, 1977, all teachers in the demonstration schools will be knowledgeable of the background and basic concepts of the metric system as determined by the administration of the Teacher Survey, showing a significant increase in the scores as demonstrated by pre and post scores on the instrument.

Analysis. Participating teachers were administered the Teacher Survey in April 1975 and a slightly revised version (Appendix A) of the same instrument in April 1976 and May 1977. The results of the testing are presented in Table 12. The survey scores are raw scores with the maximum possible score being 25.

The table presents the number of teachers(N), the mean and the standard leviation(S.D.) of the scores according to the school and overall at the top of the page. At the bottom of the page the same information is presented on the pilot schools (Treatment) and the matching schools(Control). The information is also appended with the t-statistic comparing pilot and matching schools on the bottom of the page and comparing first project year with third project year at the top of the page. Brunson teachers, on the average, missed less than six questions in 1974-75, less than five in 1975-76 and less than two in 1976-77. Wiley teachers remained almost the same during the first two years missing a little more than six on the average while in the third year missed less than three.

Overall, the number missed was less than seven the first year, less than six the second year and less than three the third year. The t-statistic indicates that the difference observed between the first and third project years is highly significant. There is less than one chance in 1,000 that the difference could have occurred by chance.

In the comparison of pilot teachers and matched teachers, a statistically significant difference in knowledge is also indicated. There is less than one chance in 1,000 that any of the differences could have occurred by chance.

Table 13 presents information on several groups of teachers who participated in metric workshops in 1975-76 and 1976-77. It indicates that the level of achievement for non-project teachers is high. On the average, for the two years reported, the teachers who participated in the workshops

TABLE 12

TEACHER SURVEY

Means and Standard Deviations

	1974-75			1975-76			1976-77			
	N	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.	T
Brunson	26	19.11	3.58	33	20.45	3.21	29	23.69	1.39	6.12**
Wiley	42	18.73	3.32	40	18.53	3.41	38	22.03	2.51	5.05**
Both	68	18.90	3.48	73	19.40	3.44	67	22.75	2.25	7.64**

TEACHER SURVEY

1976-77

	Treatment			Control			
	N	Mean	S.D.	N	Mean	S.D.	T
Elementary	29	23.69	1.39	44	19.30	1.77	11.86**
Jr. H. S.	38	22.03	2.51	25	18.28	3.10	5.07**
Total	67	22.75	2.25	69	18.93	2.37	9.65**

** $p < .001$

TABLE 13

Teacher Survey

Means and Standard Deviations

	N	Mean	S.D.
1975-76			
New Teachers	6	17.50	2.66
Winston-Salem/Forsyth-MetriContacts	52	19.00	2.78
Winston-Salem/Forsyth-Materials Workshop (K-8)	15	19.73	2.79
Winston-Salem/Forsyth-Volunteer Workshop	41	18.02	2.72
North Stokes Workshop (K-12)	39	19.08	2.66
South Stokes Workshop (K-12)	40	21.03	2.15
1976-77			
New Teachers	5	21.4	1.14
Special Education	17	17.29	3.22
Secondary Metr Contacts	18	20.83	2.09
New MetriContacts	12	21.00	3.40
Summer	26	19.08	3.30
Stokes County	21	20.86	2.26
Winston-Salem/Forsyth Elementary	671	19.55	3.33
Winston-Forsyth Jr. High School	173	19.11	3.38

scored 19.45 or they, on the average, got less than six items wrong. This indicates that, by the end of the project, participating teachers were scoring significantly higher on the average than were non-participating teachers.

Conclusion. Scores on the Teacher Survey indicate that on the average teachers are knowledgeable of the historical perspective and the basic concepts underlying metric measurement. The scores show a statistically significant difference when pilot teachers are compared with matched teachers and when pilot teachers scores for the first and third years of the project are compared.

Objective 4.1. By June 1, 1977, the project teachers will be able to identify the areas of special application of metric measurement specific to their teaching responsibilities as determined by a curriculum guide judged appropriate by a panel of curriculum and measurement experts.

Analysis. During the 1974-75 school year, all participating teachers kept a "Log of the Use of Measurement". These logs were used as guideposts when the teachers and project staff developed the broad goals of metric education and grade level behavioral objectives to achieve these goals.

As pointed out in the porgram section of this report (Chapter 4), the goals and objectives together with appropriate materials, equipment and activities have been refined into a curriculum guide which was completed and printed in early April 1976. The guide also included grade appropriate tests with one item for each behavioral objective. The tests were revised in 1976-77 to include two items for each objective. The guide was submitted to a panel of curriculum and measurement experts

as part of the activities of the third project year. These experts were recommended by the State Department of Public Instruction. The panel did not suggest any major changes. The guide has thus been supported.

Conclusion. The objective has been achieved.

Objective 5.1. By June 1, 1977, 80% of the students in the two project schools will demonstrate a level of proficiency with metric measure appropriate to their grade level as determined by criterion-referenced tests prepared and/or selected by the project direcotr, the external evaluator and the classroom teachers.

Analysis. Project staff tried to locate a standardized test for assessing the achievement of this objective for the three years of the project's duration. None was obtainable; therefore, on advice from the State Department of Public Instruction Division of Development, the project developed its own set of items, one for each objective at each grade level, during the second year. Instruments used in other locales were utilized as guidelines in the development of items appropriate to the measurement of specific objectives. The evaluator reviewed the items to assure congruence of item to objective. The test was expanded during the third project year to include two items per objective.

The tests were administered in May 1976 as a pre-test and readministered in May 1977 as a post-test measure. Table 14 presents statistics by grade on these tests. It gives the mean, standard deviation, Kuder-Richardson 20 estimate of reliability (Rel.), standard error of measurement(Stand. Error), the number

TABLE 14

Item Analysis Data by Grade on the Criterion-Referenced Tests

	1975-76						1976-77										
							Pilot					Control					
	Mean	Stand. Dev.	Rel.	Stand. Error	N	Max.	Mean	Stand. Dev.	Rel.	Stand. Error	N	Mean	Stand. Dev.	Rel.	Stand. Error	N	Max.	T
K	3.54	.75	.50	.53	52	4	7.00	.62	.00	.62	22	5.64	1.17	.32	.97	50	8	6.42*
1	10.92	1.74	.56	1.13	80	13	24.18	2.88	.84	1.15	45	19.61	3.08	.66	1.79	131	26	9.02*
2	11.56	1.60	.64	.96	101	13	23.09	2.14	.50	1.50	87	19.93	2.45	.37	1.95	109	26	9.63*
3	14.48	1.77	.51	1.24	132	18	31.88	4.07	.85	1.57	109	20.85	5.06	.74	2.59	101	36	17.32*
4	14.63	2.93	.77	1.39	141	18	29.47	5.62	.89	1.89	131	19.72	4.22	.63	2.56	75	36	10.44*
5	14.26	2.22	.76	1.08	129	16	25.30	4.36	.80	1.97	148	14.07	5.21	.78	2.42	177	32	21.15*
6	15.67	2.70	.71	1.46	144	20	29.65	7.96	.94	1.98	129	22.35	6.35	.83	2.62	185	40	8.67*
7	16.76	4.74	.80	2.14	328	27	31.80	8.81	.90	2.73	321	27.81	9.13	.90	2.89	207	48	4.97*
8	19.06	4.66	.83	1.95	306	27	33.83	8.94	.92	2.58	342	27.41	9.75	.92	2.81	205	48	7.69*

of students taking the test(N), and the maximum score on the test(Max.). This information is presented for the pilot students in 1975-76 and 1976-77. It is also presented for the matching students(Control) during 1976-77. In addition, the t-statistic is presented to compare pilot students with matching students.

The reliability estimate ranges from .50 to .83 in 1975-76 and from .00 to .94 in 1976-77 for pilot students with the reliability estimates slightly less for matching students in all grades with the exception of kindergarten. The means on the instruments are high with the difference between the actual mean and the highest possible score ranging from .46 in grade K to 10.24 in grade 7 in 1975-76 and the range being from 1.00 in grade K to 16.2 in grade 7 in 1976-77. The average difference in 1975-76 was 3.90 and in 1976-77 was 7.08.

Item statistics on each item by grade are available in the project office. They include item discrimination indices, point biserial correlation indices, item difficulty indices, and item response pattern data. This information is available both on the instrument used in 1975-76 and that used in 1976-77.

In the comparison of the pilot students with the matched students, it is evident that there is a definite difference. There is less than one chance in 1,000 that any of the differences could have occurred by chance.

Conclusion. The objective has definitely been achieved.

CHAPTER 6

Dissemination and Assimilation

The means of dissemination during the project has been through newsletters, news articles, visitors and conferences as well as workshops. The project staff has worked extremely hard trying to keep parents, teachers, school administrative staff, advisory council members and the general public informed concerning the progress and activities of the project. Listed below is a compendium of the efforts in Winston-Salem/Forsyth County:

General Newsletters(Fall and Spring each year)
1500 printed, 800 mailed, others locally distributed

Parent Newsletters(First and second years only)
7 total, each 1 page of project news and 1 or more pages of metric information

Memoranda to Project and MetriContact Teachers and Principals
75 total, detailing project plans, progress, expectations

Publication items in:
Winston-Salem Journal & Sentinel
Kernersville News
Suburbanite
AIR Metri-Gram(American Institutes for Research)
Metric Association Newsletter
Metric Bulletin
Metric News
American Metric Journal
In Basket
School News
Channel 12
Channel 2
1976 and 1977 Metric Yearbook(J.J. Keller)
North Carolina Education(NCAE)
Arithmetic Teacher
ERIC

Unsolicited requests for information have been continuous. There have also been a number of requests for inclusion on the project's regular mailing list, requests for bibliographies, guides, proposals and the Parents'Guide. The following two

pages present the information on Publications within the project and a description of Dissemination to Other Sites.

Pages 61through 66catalogue the In-County and Out-of-County Metric Events for 1975-76 and 1976-77.

A careful effort has been made to assure orderly assimilation of the project when third-year funding ends. Through cooperation efforts of the LEA and project personnel, opportunities for participation in an adequate staff-development program were planned for all K-8 teachers during 1976-77. A schedule has been operationalized for 9-12 teachers: Metri-Contacts have been trained and in-service for Adult Basic Competencies in Metrics will begin in September 1977. Leader-ship development by the project should be able to meet training needs until change-over is complete.

Metric objectives have been incorporated into the new mathematics curriculum guide which will soon be published, and into some special education guides. Classroom teaching has begun for most students at levels K-8. It should be on a steady basis within the next year. The same kind of progress should take place within secondary subject areas over the next two years.

The LEA budgeted $1.00 per child in K-6 schools for the purchase of metric materials and equipment for the 1976-77 school year. Separately. the LEA purchased a metric measurement kit(basic equipment for a school) for each of the K-6 schools, taking advantage of an excellent state contract. These amounts

Publications

	Pages	Number
Parents' Guide to Homework (Metric)	16	30,000
Materials Evaluation Instruments	16	500
Metrics in the K-8 Curriculum	120	2,000
Excerpts for Teachers	44	1,700
All Together Now - Teach Metrics	55	1,000
Excerpts for Teachers	45	1,700
Three Bears in SI Land	6	100
Metric Tests	32	400

Annual Reports (100 copies each year)

Many newsletters and handouts

Printing costs to 6-2-77 total $5804.04, for such supplies as paper, ink, and masters; all labor and overhead costs paid by LEA.

DISSEMINATION TO OTHER SITES

Materials ordered from the project:

Parents' Guide to Homework (Metric)	816
Metrics in the K-8 Curriculum	157
Materials Evaluation Forms	17
All Together Now - Teach Metrics	47
	1037

These orders have come from:

33 States
1 Pacific Island
2 Canadian Provinces

The Project has provided free materials to:

American Institutes for Research 150 copies of each
(requested for other metric projects
and metrics centers under USOE funding -
AIR is their technical information center)
149 Superintendents of public school systems in North Carolina
(1 of each item)
8 Metric education projects in the US funded under ESEA
(1 of each item)
20 local non-public K-8 schools

Administrators and/or teachers have visited from:

Camden County
Onslo County
Camp Lejeune Dependents Schools
Hickory City Schools
Stokes County
Torrington, Connecticut, Public Schools
Southern Illinois University
Mars Hill College
Appalachian State University
Wake Forest University
N.C. Regional Education Center, Greensboro
Davie County
Greensboro City Schools
Guilford County
Alamance County
Bismarck, North Dakota, Metric Project

have supplemented the usual purchases from instructional supply, media materials and special funds.

Support will be provided for secondary schools, with needs met on a departmental rather than grade-level basis. The 7-12 schools already have much metric equipment in mathematics and science departments. Additions will include meter sticks, rulers and Celsius thermometers for each classroom. Other items will depend on the needs of each school.

In-County Metric Events(1975-76)

Mini-Workshops

Forsyth Home Economists Club at Reynolds High School
March 17, 1976-2 hours-V. Daniel
35 members

Single Young Adults Club-Centenary Methodist Church
March 21, 1976-2 hours-V. Daniel

Business and Professional Womens Club
July 22, 1975-Mary Miller

Woodland Baptist School Metrics Workshop
February 21, 1976-2 hours-V. Daniel(guest of Dr. Ed. Stevens)

Old Town Women's Club-Community Center
May 27, 1976-V. Daniel

Winston-Salem Kiwanis Club-Hyatt House
October 30, 1976-V. Daniel, Miss Bradshaw and students

Winston-Salem Women's Traffic Club
April 29, 1975-V. Daniel

Mars Hill Interns-14th Street School
November 4, 1975-3 hours-V. Daniel
12 students

Non-Project School Staff Workshops

Philo-40 teachers
January 12, 1976-2 hours-V. Daniel

Konnoak-30 teachers
January 19, 1976-2 hours-V. Daniel

Bolton-20 teachers
March 8, 1976-1 hour-Rebecca Cook

PTA Programs, Non-Project Schools

Forest Park-125 members-March 9, 1976-V. Daniel

Bolton-75 members-February 2?, 1976-Jay Wise and Rebecca Cook

Out-of County Metric Events(1975-76)

Workshops for District 4 NCAE Fall Conference at Parkland High School in Winston-Salem-October 3, 1975. Two sessions, 46 participants-V. Daniel

Workshops for District 7 NCAE Fall Conference at Reidsville-October 14, 1975.Two sessions, 40 participants-Louise Bradshaw

Workshop for Southeastern Regional Elementary Principals Conference at Benton Convention Center in Winston-Salem-February 13, 1976. 25 participants-V. Daniel

Workshops for Stokes County Teachers:
10 hours, North Stokes, 46 teachers
10 hours, South Stokes, 43 teachers
This was a cooperative inter-system arrangement-V. Daniel

In-County Metric Events (1976-77)

Workshops and Programs

NCAE District 4 Conference - Parkland Senior High

Nov. 12, 1976 - 1 hour - V. Daniel
Two sessions (repeat) - 52 teachers

Statesmans Club - NCNB - Seminar

December 9, 1976 - 1 hour - V. Daniel
Implications of Metric Change - 16 senior adults

Twin City Kiwanis Club - Luncheon Program

January 27, 1977 - 1 hour - V. Daniel
Metric Update 65 businessmen

Reynolds Senior High Math Club - Program

February 3, 1977 - 45 minutes - V. Daniel
Metric Charge is Here- 20 members

Non-public School Teachers - Metrics Lab

February 12, 1977 - 3 hours - V. Daniel
Materials workshops- 30 Teachers

Mars Hill Interns - Metrics Day

March 2, 1977 - 14 interns & faculty advisor
Visitation - Wiley Laboratory School - 3 hours
Materials Workshops - Metric Lab - 3 hours - V. Daniel

Civitan Club - Luncheon Program

March 15, 1977 - 30 minutes - V. Daniel
Metric Update 43 Members

Wake Forest Math Methods Class

March 28, 1977 - Wake Forest - Teaching Techniques - 1 hour
April 1, 1977 - Metrics Lab - Materials - 2 hours - V. Daniel
22 teacher-Trainees

Old Town Jr. Woman s Club - Metrics Program

September 1976 - Rebecca Haney - 25 Members

Chancellier Community Club - Metrics Program

April 15, 1977 - Mary Sewell - 25 ladies

Xi Gamma Sorority - Metrics Program

March 1977 - Kathy Edwards - 25 Members

In-County Metric Events - cont'd

Sandersted Woman's Club - Metrics Program

February 17, 1977 - M.W. Pass - 20 Members

Board of Directo s, Saints Home Day Care Center - Metrics Workshop

May 16, 1977 - Nannie Sims - 16 People

St. Annes Circle - Metrics Program

April 4, 1977 - Faye Redmon - 20 Ladies

PTA Programs - Metrics

March 1977 - Ardmore - Lee Ann Stewart
March 1977 - Forest Park - Nannie Sims
October 1976 - Old Richmond - Faye Redmon
December 1976 - Konnoak - Hattie Ingram
April 1977 - Oak Summit - Zana Cranfill
November 1976 - Griffith Jr. - Sarah Hunter

Field Days - Metrics

May 1977 - Kernersville Elem.	240
May 2, 3, 4, 1977 - Speas Elem.	200
June 7, 1977 - Forest Park	School & Parents

Parents Workshops in Metrics

March 1977 - Kernersville Jr. Hi. - Eric Hartman - 1.5 hours

Parent Volunteers for Metrics - Workshop

May 20, 1977 - Willie Richardson - 12 parents

Parents Day Program - The Metric Store

May 18, 1977 - Kimberley Park students

Dr. IQ Metric - program for Metrics Week

May 1977 - Mineral Springs Elem.

Metrics on The Air - Songs and Poems (PA)

May 1977 - Old Richmond - 5 programs to 400 Students

Metrics Workshop for Student Teachers

March 1977 - 2 days - Speas
Elizabeth West and Mary Timmons - 7 interns

Faculty Workshops on Materials

May 1, 1977 - 18 Latham Teachers - Gwen Greene

Metrics Demonstration Lessons (not part of in-service)

March & April 1977 - Rural Hall - Mary Arnold - 30 Teachers

In-County Metric Events - cont'd

Faculty Play - 3 Bears in SI Land

April 6, 1977 - Mebane Int. - 500 students & parents

Student Play - Metric

May 30, 1977 - Ibraham 6th graders - 90 students

Metric Plays -

May 20, 1977 - Kernersville Elem.- 210 Students

Three Bears and Metric Songs - Assembly

June 3, 1977 Kernersville Elem. - 420 students

Metric Poster Contest - Metric Week

May 1977 - South Fork

Womans Club

November 1976 - Lynn Faust - 20 people

Special Display of Metric Measures

May 1977 - Philo Jr. Hi.

St. Johns CME Church Women

June 2, 1977 - Wilma Wheeler - 40 ladies

Metrics Refresher Workshops

April 1977 - Wiley - Rebecca Cook - 2 hours

Calony West Community Club Program

November 1976 - Jennie Lewis - 15 members

Appalachian State University - Master's Cluster - Workshop

June 1976 - Grace Smith

Out-of-County Metric Events (1976-77)

*NCCTM Annual Conference - Raleigh, N.C.

October 15, 16, 1977 - 1 hour - V. Daniel
Two sessions (repeat) - 75 teachers
"Metrics in the Junior High"

Awareness Conference - Division of Development, SDPI

Jan. 6, 7, 1977 - Raleigh, N.C.
One session - 1 hour - V. Daniel
"The Winston-Salem/Forsyth Metric Education Project"

Out-of-State Metric Events (1976-77)

Atlantic Coast Regional Metric Conference - Amhurst College & USOE

October 26-29, 1976 - Miami Beach, Fla.
One session - 1 hour - V. Daniel
30 Metrics project directors under OE program
"The Winston-Salem/Forsyth Program"

National Metric Conference for Educators - Michigan State University

Nov. 22-24, 1976 - Dearborn, Michigan
Two 1-hour sessions (repeat) - V. Daniel - 46 educators
"Evaluating Instructional Material"

Annual Conference - U.S. Metric Association

January 22-23, 1977 - New Orleans, La.
Two 1-hour sessions (repeat) - V. Daniel - 70 people
"Sharing Experiences in a Metrics Program"

Metrics Conference for Vocational Administrators - FAMU

May 23-27, 1977 - Tallahassee, Fla.
Two sessions - 1½ hours each - 30 administrators
"Selecting Instructional Materials"
"Securing Community Participation"

*NCCTM Annual Conference - Raleigh, N.C.

October 15, 16, 1977 - 1 hour - Jeanette Gann
Two sessions (repeat) - 50 teachers
"Metric Games and Activities"

APPENDICES

Appendix A - Teacher Survey Page - 68

Appendix B - Parent Survey Page - 71

Winston-Salem/Forsyth Metric Education Project - ESEA Title III page 1

METRICS - THE MEASURE OF YOUR FUTURE - TEACHER SURVEY

NAME _____ SCHOOL _____

Select the best answer to each of the following items and circle the corresponding letter.

1. A student's height is best measured in
   a. metres
   b. litres
   c. grams
   d. hectares
2. A quart of gasoline is about as much as a
   a. metre
   b. litre
   c. gram
   d. kilolitre
3. Which one of these statements is true?
   a. 10 centilitres = 1000 millilitres
   b. 1 metre = 100 centimetres
   c. 1 kilometre = 1000 milligrams
   d. 1 gram = 100 milligrams
4. If your cigarette is a "silly millimetre" longer, the extra amount is approximately
   a. the thickness of a dime
   b. the width of your thumb
   c. the length of your thumb
   d. the height of a telephone pole
5. The metric system has been legally used in the United States since
   a. 1790
   b. 1821
   c. 1866
   d. 1963
6. Water will boil at a temperature of
   a. 0°F
   b. 100°C
   c. 200°F
   d. none of the above
7. One hundredth of a metre is called a
   a. kilometre
   b. hectometre
   c. dekametre
   d. centimetre
8. In some countries the preferred spelling is
   a. meter
   b. metro
   c. metre
   d. all of the above
9. Carol has bought something with an area of four square centimetres. She's planning to
   a. carpet her living room
   b. make a table cloth
   c. mail a letter
   d. cover a footstool

10. Meat will usually be purchased by the
    a. millilitre
    b. kilogram
    c. kilolitre
    d. millimetre
11. The average college basketball player is probably nearest
    a. 1 m tall
    b. 2 m tall
    c. 3 m tall
    d. 4 m tall
12. Eight litres of milk is the same as
    a. 8 ml
    b. 80 ml
    c. 800 ml
    d. 8 000 ml
13. The object of the 1974 metric law is to
    a. allow the use of metric measures
    b. require the immediate use of metric measures only
    c. provide for a voluntary change to the metric system over a period of years
    d. require everyone to learn the metric system next year
14. A mass of 22 pounds is about the same as
    a. 5 kg
    b. 10 kg
    c. 15 kg
    d. 20 kg
15. A teacher is explaining how to convert English measurements to metric. The class is probably studying
    a. a new map of Germany
    b. the amount of steel produced in the U.S. and China last year
    c. last year's Olympic records
    d. a march for a pep rally
16. Johnny's temperature is 39°C. That is
    a. much above normal
    b. slightly above normal
    c. normal
    d. below normal
17. Which one of the following weighs about a kilogram?
    a. a load of coal
    b. a lemon
    c. a grain of rice
    d. a quart of iced tea
18. George has a piece of paper 20 cm by 27 cm. It is probably
    a. a blank check from his checkbook
    b. wrapping paper from his new brief case
    c. a sheet of notebook paper
    d. wallpaper for his bedroom

19. Which group includes no metric country?
    a. Canada, China, Italy, Mexico
    b. Japan, England, Russia
    c. France, Brazil, Germany
    d. Brunei, Burma, Liberia, Yemen
20. Charles picks up a 500 mg object from his desk. It is
    a. his typewriter
    b. his stapler
    c. a paperback book
    d. an aspirin for his headache
21. Three kilograms of pure water at 4°C will have a volume of
    a. 30 cubic decimetres
    b. 3 litres
    c. 3 cubic centimetres
    d. 0.3 millilitres
22. A teacher plans to visit the first country that "went metric". She must go to
    a Brazil
    b. China
    c. Greece
    d. France
23. Mrs. Black is attending a meeting in Greensboro, 30 miles away. The distance one way is about
    a. 5 km
    b. 15 km
    c. 50 km
    d. 100 km
24. The weather report predicts several days of 40°C temperature. Will most people consider that
    a. hot
    b. pleasant
    c. cold
    d. very cold
25. A ladies' shoebox is nearest in volume to
    a. 1 cubic dm
    b. 5 cubic dm
    c. .5 cubic dm
    d. 25 cubic dm

Winston-Salem/Forsyth Metric Education Project - ESEA Title III page 1

METRICS - THE MEASURE OF YOUR FUTURE - PARENT SURVEY

_____ Brunson Elementary
_____ Wiley Laboratory
_____ School Name

} School your child attends

_____ 1 _____ 5
_____ 2 _____ 6
_____ 3 _____ 7
_____ 4 _____ 8

} Grade(s) of child

Yes No Where have you learned about the Metric Education Project?

_____ _____ Newsletter
_____ _____ Newspaper
_____ _____ PTA Meetings
_____ _____ TV or Radio
_____ _____ Other _____

Yes No Where have you learned about the Metric System?

_____ _____ Dixie Classic Fair Booth
_____ _____ Parent Guide to Homework
_____ _____ Newspapers & magazines
_____ _____ School newsletters
_____ _____ Your children
_____ _____ TV or Radio
_____ _____ Books
_____ _____ Workshops and/or PTA
_____ _____ Shopping Center Exhibits
_____ _____ Other Sources _____

Select the best answer to each of the following items and circle the corresponding letter.

1. The Metric Education Project is planned to last for
   a) 1 year
   b) 2 years
   c) 3 years
   d) no limit

2. The Metric Education Project involves
   a) Brunson Elementary School only
   b) Wiley Laboratory School only
   c) Both Brunson and Wiley
   d) All North Carolina public schools

3. One purpose of the project is
   a) To prove that the Metric System is best
   b) To prove that the English System is best
   c) To avoid changing if possible
   d) To help make learning metrics easy for students

4. This year the project includes
   a) Workshops to help teachers learn metrics
   b) Classes using new metric materials
   c) Newletters about the Metric Education project
   d) All of the above

5. Planning of project activities is done by
   a) The project school staffs
   b) The project director
   c) A special Advisory Council
   d) All of the above

See what you can do with these. (Choose the best answer).

1. In the United States it is legal to measure in
   a) The English system only
   b) The metric system only
   c) Both English and metric
   d) None of the above

2. In North Carolina, the public schools
   a) Must not teach the metric system now
   b) Must all teach only the metric system now
   c) Must teach both systems now
   d) None of the above

3. A student's height is best measured in
   a) centimetres
   b) litres
   c) grams
   d) hectares

4. A quart of milk is about as much as a
   a) metre
   b) litre
   c) gram
   d) kilolitre

5. Meat will usually be purchased by the
   a) millilitre
   b) kilogram
   c) kilolitre
   d) millimetre

PLEASE HAVE YOUR CHILD RETURN THIS FORM TO HIS HOMEROOM TEACHER.

THANKS AGAIN FOR YOUR HELP.